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Language: JAPANESE [JP 2001-110939 A]

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1. JP 2001-110939 A

# CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS EXAMPLE DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

[0009] This invention performs the following down stream processing one by one in the circuit board which has the through hole where coppering was carried out for semiconductor packages. [0010] 1) Or it applies a solder resist to the part besides the individual reason which a solder side should carry out PURIFURAKKUSU processing the individual reason which should carry out partial electrolytic plating of the component side of the formation process circuit board of a solder resist pattern outside, carry out alkali treatment of the part which should apply and carry out photo-curing of the photoresist solder resist to each field of the circuit board, and should plate un-hardening the back, and the part which should carry out PURIFURAKKUSU processing, and form a solder resist pattern. As for a solder resist, the various solder resists of a photo-curing mold and a heat-curing mold are used. For example, Taiyo Ink Mfg. PSR-4000 grade is mentioned. The approach of spreading that generally the approach of spreading is used, for example, screen printing, the roll coater method, the spray-coater method, the curtain coating-machine method, the dip coater method, etc. are used.

[0011] 2) By potassium permanganate or the potassium chromate, carry out etching processing, roughen the solder resist side suffered before the surface roughening process electroless deposition of a solder resist, and improve the adhesion of electroless deposition copper.

[0012] The drug solution generally used is used about the non-electrolytic copper plating liquid used at the following processes, a software etching reagent, electrolysis nickel / liquid gilding, and water-soluble PURIFURAKKUSU liquid.

[0013] 3) Non-electrolytic copper plating is performed all over the substrate side which was not applied not to mention the whole surface of the process solder resist of non-electrolytic copper plating. This secures the flow object of partial electrolytic plating. The presentations of liquid are a Rochell salt bath, an EDTA bath, etc., and perform coppering to the whole surface. As copper thickness, it is 0.2-1.0 micrometers and the whole surface is covered by the metal copper coat.

[0014] 4) Carry out plating resist formation to a solder side in a plating resist formation process solder side. By forming a plating resist, etching of a solder side is prevented at the etching process of the non-electrolytic copper of five component sides. As a plating resist, it forms by spreading of a liquefied resist, or attachment of a dry film. For example, SANFOTO by Asahi Chemical [Co., Ltd.] Co., Ltd. is used. Deform to electroless deposition, or electrolysis nickel / gold plate, it dissolves, or the stable film not exfoliating is used.

[0015] 5) This process is a process which carries out etching removal of the non-electrolytic copper of a component side like etching of non-electrolytic copper. As for an etching solution, the so-called software etching reagent or the so-called etching reagents, such as persulfate, a sulfuric acid-hydrogen-peroxide solution, and a ferric chloride, the solution of hydrochloric acid of a cupric chloride, are used. There is also effectiveness of raising the adhesion of electrolysis nickel / gold plate coat, by changing into the condition of having roughened the copper surface of a component side, by this approach.

[0016] 6) Use the non-electrolytic copper of electrolysis nickel / gold plate process solder side as a flow object for partial electrolytic plating. It has connected electrically through the flow of the ball pad of a solder side, and the pad of the through hole and component side by which coppering was carried out, and electrolysis nickel / golden coat is deposited in the copper pad side of the exposed component side by electrolytic plating, for example, nickel-plating conditions -- the electrolytic plating in a Watts bath and a sulfamic acid bath, and gold plate conditions -- wirebonding -- public funds -- OUBERU of plating liquid, Inc., for example, Metex. ORUNA of Kamamura Industry, the tempoh resist liquid of Japanese High grade Chemistry, etc. perform.

[0017] 7) Remove the removal process of the plating resist of a solder side, then the plating resist of a solder side (it exfoliates for example, in an alkaline water solution), and expose the solder resist side where non-electrolytic copper plating of the solder side was carried out.

[0018] 8) By the same approach as the etching process of the non-electrolytic copper of the component side of the etching process 5 of the non-electrolytic copper of a solder side, carry out etching removal of the non-electrolytic copper of the garbage of a solder side, and form an independent copper circuit pattern. By this approach, it changes into the condition of having roughened the copper surface of a solder side, and there is also effectiveness of carrying out PURIFURAKKUSU processing and raising the adhesion of a PURIFURAKKUSU coat. On the other hand, at this etching process, the effect of the dissolution etc. does not receive the electrolysis nickel / golden coat of a component side.

[0019] 9) Carry out PURIFURAKKUSU processing to a PURIFURAKKUSU down-stream-processing solder side, and form a PURIFURAKKUSU coat in it. oxidation of the copper surface which is carrying out retention period China-Russia appearance of this coat, and prevention of dirt -- it carries out for the purpose of improvement in soldering nature further. As PURIFURAKKUSU processing, although any approach is possible, PURIFURAKKUSU processing (it processes with the drug solution of for example, an alkyl imidazole system) of an adsorption mold is especially effective. The art is based on immersion, a spray, etc. in a solder side.

[0020] As mentioned above, by performing one to 9 process, the substrate for semiconductor packages which has electrolysis nickel / golden coat in a component side, and has the pad of a PURIFURAKKUSU coat in a solder side could be manufactured, and the manufacture approach was established.

[0021]

[Example] Hereafter, the example of this invention is explained based on a drawing. The used BGA substrate referred to the "printed circuit technical handbook" (volume on printed circuit society), and the substrate of the independent copper circuit pattern which does not have the lead wire for partial electrolytic plating was formed and used for it.

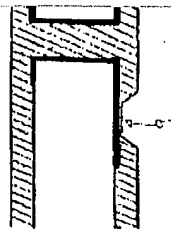
1) The solder resist used by formation process this invention of a solder resist pattern is PSR-4000 of Taiyo Ink Mfg., Inc. The solder resist was applied to both sides of the substrate in which the copper circuit pattern was formed, with screen printing, after ultraviolet-rays exposure, alkali development was carried out and the pattern was formed.

2) [Drawing 1] which processed the substrate in which the surface roughening process solder resist pattern of a solder resist was formed, in alkaline potassium permanganate, and etched the solder resist front face.

3) A non-electrolytic copper coat is deposited on the whole surface with the process Rosell salt bath of non-electrolytic copper plating. Copper thickness was 0.3 micrometers. [Drawing 2] to

Drawing selection

Representative drawing



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3) A non-electrolytic copper coat is deposited on the whole surface with the process Rosell salt bath of non-electrolytic copper plating. Copper thickness was 0.3 micrometers. [Drawing 2] to which copper metal deposited with sufficient adhesion in homogeneity on the whole surface although the condition of the film of non-electrolytic copper plating was observed by visual inspection.

4) [Drawing 3] which sticks a dry film on a solder side in a plating resist formation process solder side. The used dry film is product SANFOTO of Asahi Chemical Co., Ltd.  
 5) Soak the copper which deposited by the electroless deposition which deposits in the etching process component side of the non-electrolytic copper of a component side in a sulfuric-acid-hydrogen-peroxide solution, and etching removes the non-electrolytic copper which deposited in the copper pad of a solder resist side or a substrate side. It is [Drawing 4] by which the copper of a solder resist side was removed completely, non-electrolytic copper dissolved the copper pad side, and surface roughening was carried out. Exfoliate \*\*\*\* [ and ] had not happened at all. [ that the dry film of a solder side deforms ] The conductivity of the copper surface of the non-electrolytic copper of a solder side and the pad of a component side was investigated, and it also checked having flowed completely.

6) The substrate was set to the electrolysis nickel / gold plate process Watts bath of a component side (NISO4-NIC12-H3BO4 solution), the non-electrolytic copper of a solder side was connected with the cathode of electroplating, and electroplating (1 A/dm<sup>2</sup>x 20 minutes) was carried out. Then, [Drawing 5] to which the substrate was moved to OUBERU of Meltex, Inc., electroplating (0.3 A/dm<sup>2</sup>x 3 minutes) was performed, and gold deposited on the nickel side. Checking the plating thickness of nickel / golden coat by the fluorescence-X-rays thickness gage, nickel-plating thickness was 5 micrometers and gold plate thickness was 0.5 micrometers. On the other hand, the deposit of the metal of nickel/gold was not accepted in a solder side at all.

7) [Drawing 6] to which the substrate was soaked in the removal process alkali solution of the plating resist of a solder side, dissolution removal of the dry film of a solder side was completely carried out, and the substrate side by which non-electrolytic copper plating was carried out was exposed. The nickel / gold plate coat of a component side were not changing with these action at all.

8) [Drawing 7] which carried out etching removal of the non-electrolytic copper of a solder side with the hydrogen-peroxide-sulfuric-acid solution by the same approach as the etching process of the non-electrolytic copper of the component side of the etching process 5 of the non-electrolytic copper of a solder side. Non-electrolytic copper dissolved completely and the solder resist side, the roughened copper pad side in which solder is carried, and the base material resin front face have been checked. The nickel / gold plate side of a component side were not changing with these action at all.

9) Soak a substrate in the MEKKU seal (CL-5824SN) solution by PURIFURAKKUSU down-stream-processing MEC COMPANY LTD., and process the copper front face of a solder side. As for the condition, 30 degree-Cx 1 minute was suitable. It checked that investigated that the complex is formed in a copper front face, and the coat of an imidazole complex was formed all over copper with IR measurement machine of a reflective mold. On the other hand, the absorption spectrum which nickel / golden coat requires for an imidazole is [Drawing 8] which was not able to be checked at all. The substrate for semiconductor packages which has nickel / golden coat in a component side, and has the pad of a PURIFURAKKUSU coat in a solder side from the above result was checked. The substrate for semiconductor packages which has nickel / golden coat in a component side, and has the pad of a PURIFURAKKUSU coat in a solder side carried the semi-conductor in the component side, made golden wirebonding the semi-conductor and the pad of nickel / golden coat, and connected with them, the solder ball was carried for the pull (Pull) reinforcement of wirebonding in the PURIFURAKKUSU coat of a solder side, and the shear (Shear) reinforcement of a solder ball was examined. Consequently, it checked that the pull reinforcement of wirebonding had also shown the effectiveness which was excellent also in both the shear reinforcement of a solder ball. It collects together and the result of 20 points each is written so that it can compare with the result of the example of a comparison.

[0022]

[Comparative Example (s)] Although golden wirebonding was performed to the same substrate as having used it in the example to the pad which does not attach the nickel / golden coat of 6, it was not connectable with it. The pad which attached nickel / golden coat showed the pull reinforcement of the same wirebonding as an example. Moreover, in the pad which does not have a PURIFURAKKUSU coat, and the nickel / golden coat, although the solder ball could be carried, it brought a little low result in ball shear reinforcement. On the other hand, the pad of a PURIFURAKKUSU coat showed the reinforcement of same extent as the value of an example in the shear reinforcement of a solder ball.

プル強化 (金線値: e)	
(銅-ニッケル: 0.76mm)	3.0mm
(単位: kg)	(単位: kg)
1. 7~1.9	2.2~2.8
ニッケル / 金 1. 3~1.5	2.2~2.8
プル強化 1. 7~1.9	2.2~2.8
金線値 1. 4~1.8	2.2~2.8

\*1: ワイヤボンディング不可

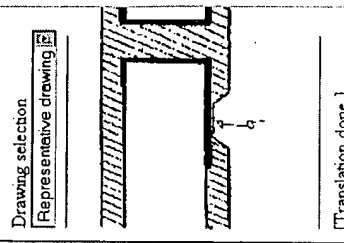
[0023]

[Effect of the Invention] Both the substrates for semiconductor packages that have nickel / golden coat in a component side, and have the pad of a PURIFURAKKUSU coat in a solder side have the effectiveness which was excellent in the pad of nickel / golden coat, the adhesion of golden wirebonding, the adhesion of the solder ball of the PURIFURAKKUSU coat of a solder side, and wettability. Moreover, it can respond also to small and light-ization by utilizing the deleted wiring section for partial electrolytic plating.

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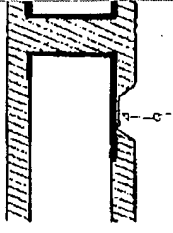
CLAIMS

[Claim(s)]

[Claim 1] The substrate for semiconductor packages which has the pad of a PURIFURAKKUSU coat in a semiconductor device loading side in electrolysis nickel and a golden coat, and a solder ball loading side [claim 2] In the circuit board which has the through hole by which coppering was carried out 1) Etching process 6 electrolysis nickel of non-electrolytic copper plating of the process 5 semiconductor-device loading side which forms a plating resist in the process 4 solder ball loading side of surface roughening process 3 non-electrolytic copper plating of formation process 2 solder resist of a solder resist pattern To the semiconductor loading side characterized by performing etching process 9 PURIFURAKKUSU down stream processing of non-electrolytic copper plating of the plating resist removal process 8 solder ball loading side of a gold plate process 7 solder ball loading side, and electrolysis nickel and a golden coat. The manufacture approach of the substrate for semiconductor packages of having the pad of a PURIFURAKKUSU coat in a solder ball loading side [claim 3] The manufacture approach of the substrate for semiconductor packages of having the pad of a PURIFURAKKUSU coat the back as a flow object for partial electrolytic plating in electrolysis nickel and a golden coat, and a solder ball loading side using non-electrolytic copper plating in the semiconductor loading side according to claim 2 characterized by carrying out etching removal

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]  
[Drawing 1] The printed circuit board in which the pattern of a solder resist was formed to both sides  
[Drawing 2] The printed circuit board which deposited the non-electrolytic copper coat on the whole surface  
[Drawing 3] The printed circuit board which stuck the plating resist on the solder side  
[Drawing 4] The printed circuit board which dissolved the non-electrolytic copper coat of a component side  
[Drawing 5] The printed circuit board which formed electrolysis nickel / golden coat in the component side  
[Drawing 6] The printed circuit board which removed the plating resist of a solder side  
[Drawing 7] The printed circuit board which dissolved the non-electrolytic copper coat of a solder side  
[Drawing 8] The substrate for semiconductor packages which formed electrolysis nickel / golden coat in the component side, and formed the PURIFURAKKUSU coat in the solder side

[Description of Notations]  
1: Insulating layer  
2: Copper pattern  
3: The through hole by which coppering was carried out  
4: Solder resist side  
5: Non-electrolytic copper plating side  
6: Plating resist side  
7: The roughened copper pattern side  
8: Electrolysis nickel / gold plate coat  
9: PURIFURAKKUSU coat

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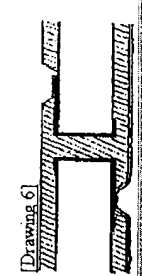
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- ## DRAWINGS



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